REMARKS

The Office Action notes that claims 1, 2, 4, 5, 17, 21, 23, 24, 27, 35, and 36 are pending in the application. By this amendment, claims 1, 27, 35, and 36 have been amended and claims 2, 4, and 5 have been cancelled. The amendments to claims 1, 27, 35, and 36 are fully supported by the specification and do not add any new matter to the application. Therefore, claims 1, 17, 21, 23, 24, 27, 35, and 36 are currently pending in the application.

In the Office Action, the Examiner: (1) rejected claims 35 and 36 under 35 USC §112, second paragraph; and (2) rejected claims 1, 2, 4, 5, 17, 21, 23, 24, 27, 35, and 36 under 35 USC §103(a). Applicant responds to the Examiner's rejections below.

Claim Rejections – 35 USC §112, second paragraph

The Examiner rejected claims 35 and 36 under 35 USC §112, second paragraph, because the Examiner believed that the claims were indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Applicant respectfully traverses this rejection.

The Examiner believes that that the language "consisting of a predetermined number of star trackers" in claim 35 and "consisting of a predetermined number of star trackers and at least one gyro device" in claim 36 is contradictory as it is not known how many star trackers or gyro devices there are. Applicant respectfully submits that this language is not contradictory and that the language is clear.

Claim 35 states "consisting of a predetermined number of star trackers," which means that the attitude sensor set can have any number of star trackers, but no other types of sensors. For example, an attitude determination and control system that had an attitude sensor set used for

both transfer orbit operation and on-station operation that had a star tracker and a sun sensor would not be covered by claim 35 since claim 35 is limited to one or more star trackers only.

Similarly, claim 36 states "consisting of a predetermined number of star trackers and at least one gyro device," which means that the attitude sensor set can have any number of star trackers and gyro devices, but no other types of sensors. For example, an attitude determination and control system that had an attitude sensor set used for both transfer orbit operation and on-station operation that had a star tracker, a gyro device, and a sun sensor would not be covered by claim 36 since claim 36 is limited to one or more star trackers and one or more gyro devices only.

Claim Rejections – 35 USC §103(a)

1. Hosick in view of van Bezooijen (Claims 1, 2, 4, 5, and 21)

The Examiner rejected claims 1, 2, 4, 5, and 21 under 35 USC §103(a) as being unpatentable over US Patent No. 6,032,904 (Hosick) in view of US Patent No. 5,745,869 (van Bezooijen). Applicant respectfully submits that claims 1 and 21 (claims 2, 4, and 5 have been cancelled) are patentable over Hosick in view of van Bezooijen.

As for independent claim 1, neither Hosick nor van Bezooijen discuss or suggest: (1) "software that determines the attitude of the spacecraft, spacecraft spin rate, and spacecraft acceleration, during both transfer orbit operations and on-station operations based solely on the input received from the star tracker"; or (2) "a means for controlling the spacecraft based on the attitude, spin rate, and acceleration of the spacecraft determined by the processor" as recited in independent claim 1, as amended.

In Hosick, an entire sensor suite (32), which contains earth sensors, a set of gyroscopes, and possibly several sun sensors and/or a star tracker (see col. 6, ll. 59-65), is used to determine

spacecraft attitude and orientation (see col. 6, ll. 56-59). Nowhere does Hosick discuss or suggest that the attitude of the spacecraft is or can be determined based on the input received from only one of the sensors in the sensor suite or that a single sensor can be used to determine spin rate and/or acceleration.

Similarly, in Hosick, input from the entire sensor suite (32) is also used to control the spacecraft (see col. 9, l. 61 – col. 10, l. 6). Nowhere does Hosick discuss or suggest that the spacecraft can be controlled based on the input received from only one of the sensors. Therefore, Hosick discloses a system where an entire sensor suite is required in order to determine the attitude, spin rate, and acceleration of the spacecraft and to control the spacecraft.

In addition, van Bezooijen does not discuss or suggest the use of single sensor to determine spacecraft attitude *during transfer orbit operations* or the use of a single sensor to determine spacecraft spin rate or acceleration. van Bezooijen only teaches the use of an autonomous star tracker (AST) to determine spacecraft attitude during on-station operations (see e.g. col. 4, ll. 36-40 "After a slew to a new target, AST 10, operating in update mode, identifies the stars 2 in its field of view 20, determines its attitude..."). Nowhere does van Bezooijen discuss or suggest using the AST to determine spacecraft attitude *during transfer orbit operations* or that the AST is capable of determining spacecraft spin rate and/or acceleration during both transfer orbit and on-station operations.

Similarly, van Bezooijen does not discuss or suggest the use of the input from the AST to control the spacecraft or that the input from the AST is sufficient to control the spacecraft. van Bezooijen only discusses a spacecraft that uses the AST to determine spacecraft attitude during on-station operations.

Therefore, even if such a combination as Hosick and van Bezooijen were made, which Applicant does not concede is proper, the purported combination still would not reflect all of the elements recited in claim 1. For example, the combination still would not disclose or suggest an attitude determination and control system that determines attitude, spin rate, and acceleration *during transfer orbit operations* based on the input of a single star tracker or a means for controlling the spacecraft based on the input from a single star tracker. Claim 21 depends from independent claim 1 and for the reasons stated above is also patentable over Hosick in view of van Bezooijen.

2. Hosick in view of van Bezooijen and Boeing 702 Fleet (Claim 17)

The Examiner rejected claim 17 under 35 USC §103(a) as being unpatentable over Hosick in view of van Bezooijen and further in view of Boeing 702 fleet. Applicant respectfully submits that claim 17 is patentable over Hosick in view of van Bezooijen and further in view of Boeing 702 fleet.

Claim 17 depends from independent claim 1. As discussed above for independent claim 1, neither Hosick nor van Bezooijen discuss or suggest: (1) "software that determines the attitude of the spacecraft, spacecraft spin rate, and spacecraft acceleration, during both transfer orbit operations and on-station operations based solely on the input received from the star tracker"; or (2) "a means for controlling the spacecraft based on the attitude, spin rate, and acceleration of the spacecraft determined by the processor" as recited in independent claim 1, as amended. In addition, the Boeing 702 fleet does not discuss or suggest these limitations. Therefore, even if such a combination as Hosick, van Bezooijen, and the Boeing 702 fleet were made, which Applicant does not concede is proper, the purported combination still would not reflect all of the elements recited in claim 17.

3. Hosick in view of van Bezooijen and Baghdasarian (Claims 23 and 24)

The Examiner rejected claims 23 and 24 under 35 USC §103(a) as being unpatentable over Hosick in view of van Bezooijen and further in view of US Patent No. 6,010,096 (Baghdasarian). Applicant respectfully submits that claims 23 and 24 are patentable over Hosick in view of van Bezooijen and further in view of Baghdasarian.

Claims 23 and 24 depend from independent claim 1. As discussed above for independent claim 1, neither Hosick nor van Bezooijen discuss or suggest: (1) "software that determines the attitude of the spacecraft, spacecraft spin rate, and spacecraft acceleration, during both transfer orbit operations and on-station operations based solely on the input received from the star tracker"; or (2) "a means for controlling the spacecraft based on the attitude, spin rate, and acceleration of the spacecraft determined by the processor" as recited in independent claim 1, as amended. In addition, Baghdasarian does not discuss or suggest these limitations. Therefore, even if such a combination as Hosick, van Bezooijen, and Baghdasarian were made, which Applicant does not concede is proper, the purported combination still would not reflect all of the elements recited in claims 23 and 24.

4. Hosick in view of van Bezooijen and Needelman (Claims 27, 35, and 36)

The Examiner rejected claims 27, 35, and 36 under 35 USC §103(a) as being unpatentable over Hosick in view of van Bezooijen and further in view of US Patent No. 6,266,616 (Needelman). Applicant respectfully submits that claims 27, 35, and 36 are patentable over Hosick in view of van Bezooijen and further in view of Needelman.

As for independent claim 27, neither Hosick, van Bezooijen, nor Needelman discuss or suggest: (1) "software that determines the attitude of the spacecraft, spacecraft spin rate, and spacecraft acceleration, during both transfer orbit operations and on-station operations based solely on the input received from one of the star trackers"; or (2) "a means for controlling the

spacecraft based on the attitude, spin rate, and acceleration of the spacecraft determined by the processor" as recited in independent claim 27, as amended.

As discussed above, in Hosick, an entire sensor suite (32), which contains earth sensors, a set of gyroscopes, and possibly several sun sensors and/or a star tracker (see col. 6, ll. 59-65), is used to determine spacecraft attitude and orientation (see col. 6, ll. 56-59). Nowhere does Hosick discuss or suggest that the attitude of the spacecraft is or can be determined based on the input received from a single star tracker or that a single star tracker can be used to determine spin rate and/or acceleration.

Similarly, in Hosick, input from the entire sensor suite (32) is also used to control the spacecraft (see col. 9, l. 61 – col. 10, l. 6). Nowhere does Hosick discuss or suggest that the spacecraft can be controlled based on the input received from only a single star tracker. Hosick only discloses a system where an entire sensor suite is required in order to determine the attitude, spin rate, and acceleration of the spacecraft and to control the spacecraft.

Needelman also does not discuss or suggest the use of a single star tracker to determine spacecraft attitude *during transfer orbit operations* or the use of a single star tracker to determine spacecraft spin rate or acceleration. Needelman only teaches the use of star trackers to determine spacecraft attitude during on-station operations. In order to determine attitude during transfer orbit operations, an entire sensor suite of various sensors is required (see col. 3, l. 43 – col. 4, l. 7), just as in Hosick. Nowhere does Needelman discuss or suggest that the attitude of the spacecraft *during transfer orbit operations* can be determined based on the input of a single star tracker or that a single star tracker can be used to determine spin rate and/or acceleration.

Similarly, nowhere does Needelman discuss or suggest that the spacecraft can be controlled based on the input received from only a single star tracker. As above, in Needelman,

an entire sensor suite of various sensors is required to control the spacecraft (see col. 3, l. 43 – col. 4, l. 7).

Finally, as discussed above, van Bezooijen does not discuss or suggest the use of a single star tracker to determine spacecraft attitude *during transfer orbit operations* or the use of a single star tracker to determine spacecraft spin rate or acceleration at all. van Bezooijen only teaches the use of an autonomous star tracker (AST) to determine spacecraft attitude during on-station operations (see e.g. col. 4, ll. 36-40 "After a slew to a new target, AST 10, operating in update mode, identifies the stars 2 in its field of view 20, determines its attitude..."). Nowhere does van Bezooijen discuss or suggest using the AST to determine spacecraft attitude *during transfer orbit operations* or that the AST is capable of determining spacecraft spin rate and/or acceleration during both transfer orbit and on-station operations.

Similarly, van Bezooijen does not discuss or suggest the use of the input from the AST to control the spacecraft. van Bezooijen only discusses and spacecraft that uses the AST to determine spacecraft attitude during on-station operations.

Therefore, even if such a combination as Hosick, van Bezooijen, and Needelman were made, which Applicant does not concede is proper, the purported combination still would not reflect all of the elements recited in claim 27. For example, the combination still would not disclose or suggest an attitude determination and control system that determines attitude, spin rate, and acceleration *during transfer orbit operations* based on the input of a single star tracker or a means for controlling the spacecraft based on the input from a single star tracker.

As for independent claim 35, neither Hosick nor van Bezooijen nor Needelman discuss or suggest: (1) "an attitude sensor set used for both transfer orbit operation and on-station operation of the spacecraft, the attitude sensor set consisting of a predetermined number of star trackers";

or (2) "software used for both transfer orbit and on-station attitude, spin rate, and acceleration determination and spacecraft control using solely the input from the attitude sensor set" as recited in independent claim 35, as amended.

As discussed above, Hosick only discloses the use of an entire sensor suite (32), which contains earth sensors, a set of gyroscopes, and possibly several sun sensors and/or a star tracker. Nowhere does Hosick disclose that the sensor suite can contain only star trackers.

Similarly, as discussed above, Hosick only discloses the use of the entire sensor suite (32) to determine spacecraft attitude, spin rate, and acceleration. Nowhere does Hosick teach that spacecraft attitude, spin rate, and/or acceleration can be determined from the input received only from star trackers.

In addition, van Bezooijen does not disclose a sensor set that consists of only star trackers that can be used for *transfer orbit operations*. The sensor set in van Bezooijen is only used for on-station operations.

Similarly, van Bezooijen does not teach the use of only star trackers to determine attitude *during transfer orbit operations* or the use of only star trackers to determine spin rate and/or acceleration. The input from the AST in van Bezooijen is only used to determine attitude during on-station operations. There is no disclosure of the AST being sufficient to determine attitude *during transfer orbit operations* or to determine spin rate and/or acceleration at all.

Finally, Needelman does not disclose a sensor set that consists of only star trackers that can be used for *transfer orbit operations*. The star trackers in Needelman are used to determine attitude during on-station operations, however, an entire sensor suite consisting of a variety of different sensors is used to determine attitude *during transfer orbit operations*.

Similarly, Needelman does not teach the use of only star trackers to determine attitude *during transfer orbit operations* or the use of only star trackers to determine spin rate and/or acceleration. The input from the star trackers in Needelman is only used to determine attitude during on-station operations. The input from an entire sensor suite consisting of a variety of different sensors is used to determine attitude *during transfer orbit operations* and there is no teaching of using the input from only the star trackers to determine spin rate and/or acceleration.

Therefore, even if such a combination as Hosick, van Bezooijen, and Needelman were made, which Applicant does not concede is proper, the purported combination still would not reflect all of the elements recited in claim 35. For example, the combination still would not disclose or suggest a sensor set used for transfer orbit operation that consists of only star trackers or the use of only the input from star trackers to determine spacecraft attitude, spin rate, and acceleration during transfer orbit operations or to control the spacecraft.

As for independent claim 36, neither Hosick nor van Bezooijen nor Needelman discuss or suggest: (1) "an attitude sensor set used for both transfer orbit operation and on-station operation of the spacecraft, the attitude sensor set consisting of a predetermined number of star trackers and at least one gyro device"; or (2) "software used for both transfer orbit and on-station attitude, spin rate, and acceleration determination and spacecraft control using solely the input from the attitude sensor set" as recited in independent claim 36, as amended.

As discussed above, Hosick only discloses the use of an entire sensor suite (32), which contains earth sensors, a set of gyroscopes, and possibly several sun sensors and/or a star tracker. Nowhere does Hosick disclose that the sensor suite can contain only star trackers and gyro devices.

Similarly, as discussed above, Hosick only discloses the use of the entire sensor suite (32) to determine spacecraft attitude, spin rate, and acceleration. Nowhere does Hosick teach that spacecraft attitude, spin rate, and/or acceleration can be determined from the input received only from star trackers and gyro devices.

In addition, van Bezooijen does not disclose a sensor set that consists of only star trackers and gyro devices that can be used for *transfer orbit operations*. The AST in van Bezooijen contains only star trackers and is only used for on-station operations.

Similarly, van Bezooijen does not teach the use of only star trackers and gyro devices to determine attitude *during transfer orbit operations* or the use of only star trackers and gyro devices to determine spin rate and/or acceleration. The input from the AST in van Bezooijen, which only contains star trackers, is only used to determine attitude during on-station operations. There is no disclosure of the AST having gyro devices or of the AST being sufficient to determine attitude *during transfer orbit operations* or to determine spin rate and/or acceleration.

Finally, Needelman does not disclose a sensor set that consists of only star trackers and gyro devices that can be used for *transfer orbit operations*. The star trackers in Needelman are used to determine attitude during on-station operations, however, an entire sensor suite consisting of a variety of different sensors is used to determine attitude *during transfer orbit operations*.

Similarly, Needelman does not teach the use of only star trackers and gyro devices to determine attitude *during transfer orbit operations* or the use of only star trackers and gyro devices to determine spin rate and/or acceleration. The input from the star trackers in Needelman is only used to determine attitude during on-station operations. The input from an entire sensor suite consisting of a variety of different sensors is used to determine attitude *during*

transfer orbit operations and there is no teaching of using the input from only the star trackers and gyro devices to determine spin rate and/or acceleration.

Therefore, even if such a combination as Hosick, van Bezooijen, and Needelman were made, which Applicant does not concede is proper, the purported combination still would not reflect all of the elements recited in claim 36. For example, the combination still would not disclose or suggest a sensor set used for transfer orbit operation that consists of only star trackers and gyro devices or the use of only the input from star trackers and gyro devices to determine spacecraft attitude, spin rate, and acceleration during transfer orbit operations or to control the spacecraft.

Conclusion

In view of the aforesaid, Applicant respectfully submits that claims 1, 17, 21, 23, 24, 27, 35, and 36 are in condition for allowance and a Notice of Allowance for these claims is respectfully requested.

Respectfully submitted,

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